Transportation Committee Workshop

Updating the Greenhouse Gas Inventory Produced by Electricity Generated Out-of-State

June 7, 2006

Call-in Number: 888-455-9639

Passcode: Greenhouse Gas

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Presentation Overview

- Purpose of Resource Mix Analysis
- Existing Methodology and Limitations
- Role of Electricity Imports
- Proposed Approach to Estimate Resource Mix

Purpose of Resource Mix Analysis

- Develop and update the California greenhouse gas emissions inventory
- Improve the methodology to estimate GHG emission associated with electricity imports
- Properly represent actual generation dispatch decisions
- Reflect the different types of electricity market transactions
- Consistent with other system studies

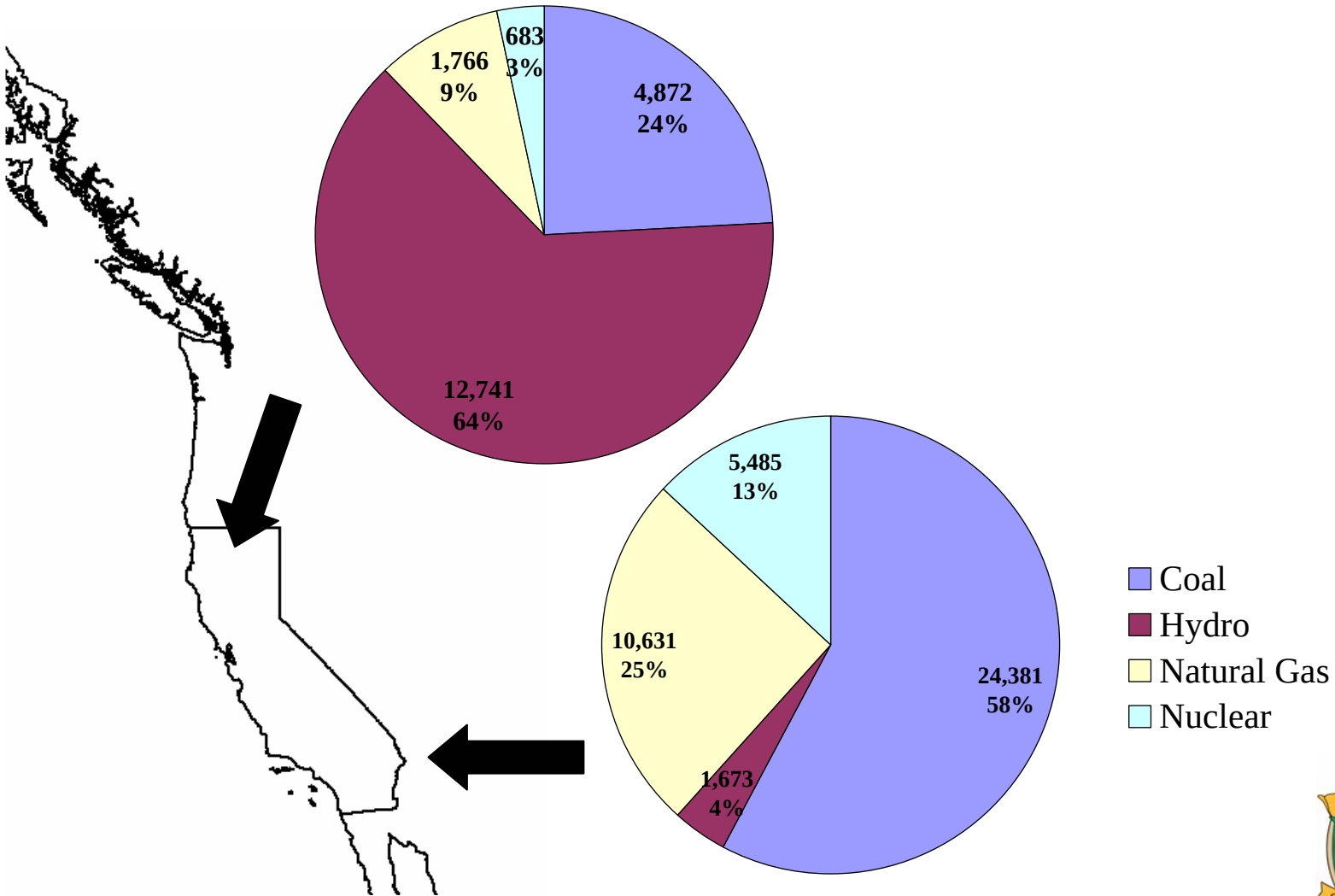
Data Availability to Track Imports

- Metered power flows between CA and out-of-state control operators
- Electricity generation and fuel use by power plant
- Power Source Disclosure for 70% of CA
- FERC Electronic Quarterly Reporting
- Limited information on the generation source of the electricity imports

Existing Methodology Used for GHG Emissions Imports Inventory

- Identify imports from known sources
- Balance of imports estimated
  - 1990 to 1999 import estimates based on 1994 Electricity Report findings
  - 2000 to present GHG emission estimates apply the average generation mix in each region
- Net System Power Report assumes average generation mix for all imports

Net System Power Report
Imports from PNW and SW (GWh)



Limitations of Existing Approach

- Ignores daily dispatch decisions and system constraints
- Does not capture the types of electricity market transactions
- Likely overstates estimated electricity imports from out-of-state baseload generators
- Proposed methodology intended to resolve these problems

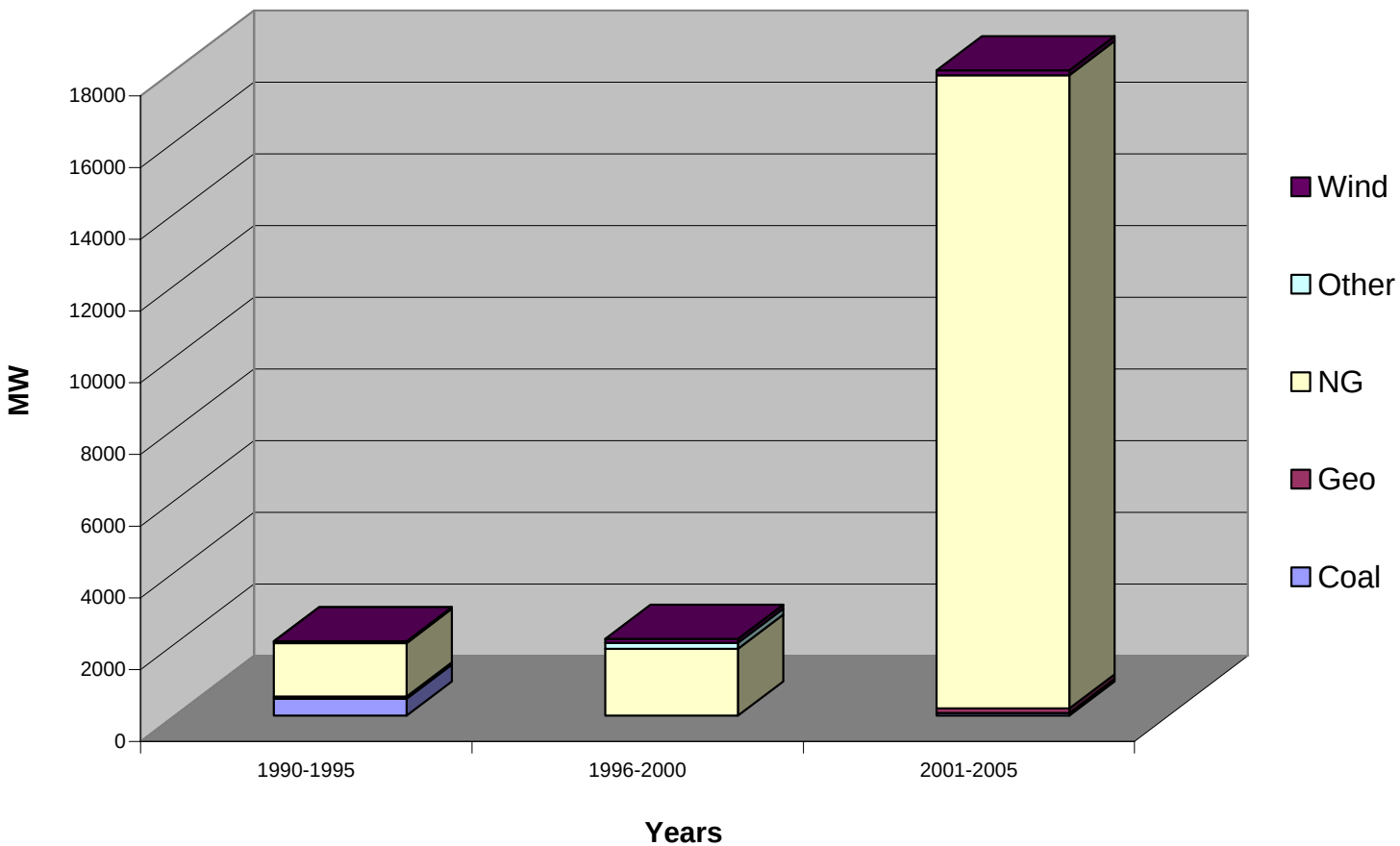
Types of Electricity Imports

- Ownership shares of generation located out-of-state
- Contracts and other entitlements
- Purchases to satisfy customer obligations
- Purchases to cover unexpected short-term variations (i.e. forced outages)
- Economy Purchases
- Wheeling through CA

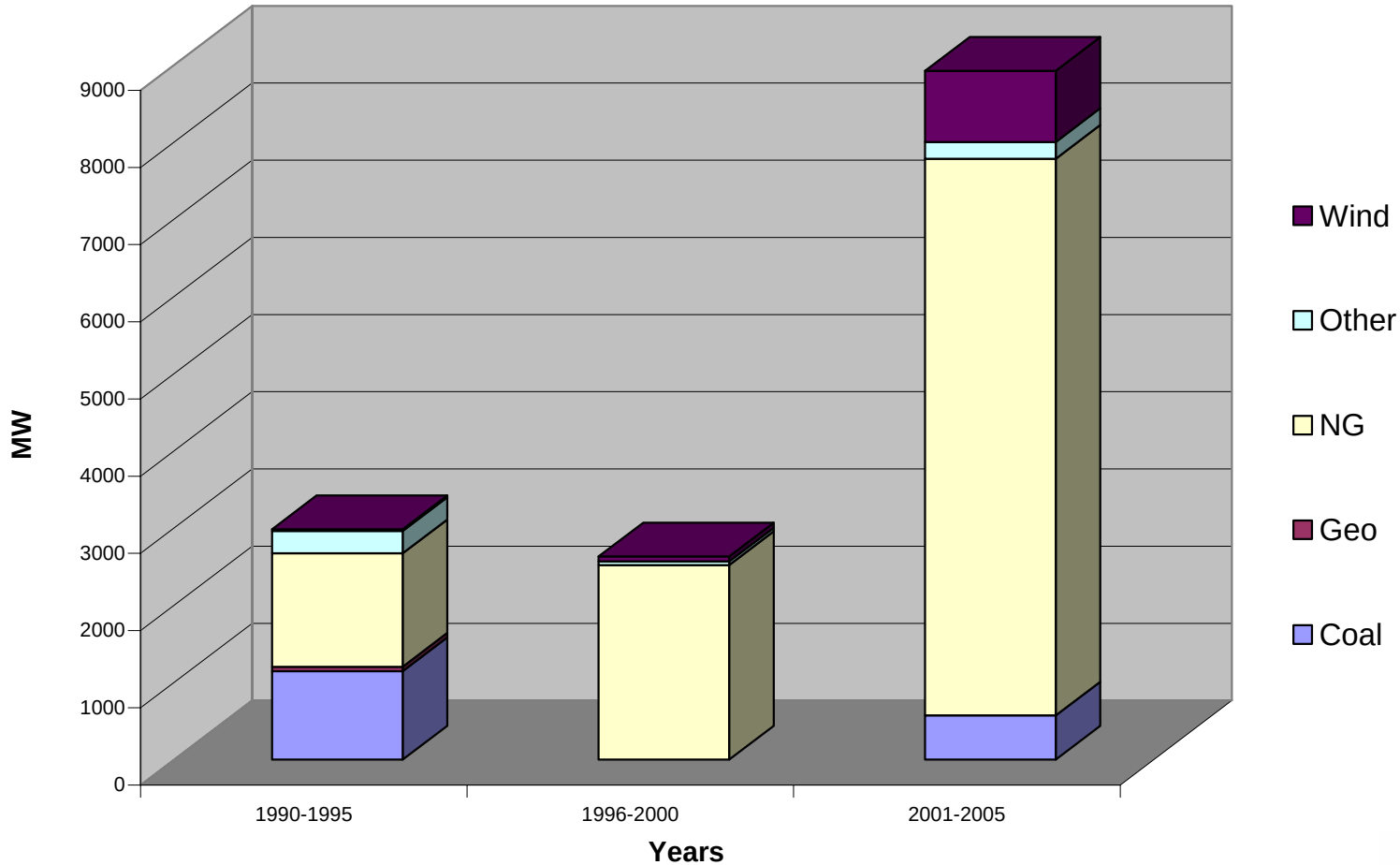
Market Opportunities to Purchase Out-of-State Electricity

- Diversity Opportunities due to the generation mix and peak load differences between regions
- Currently a large surplus of generation capacity in the West

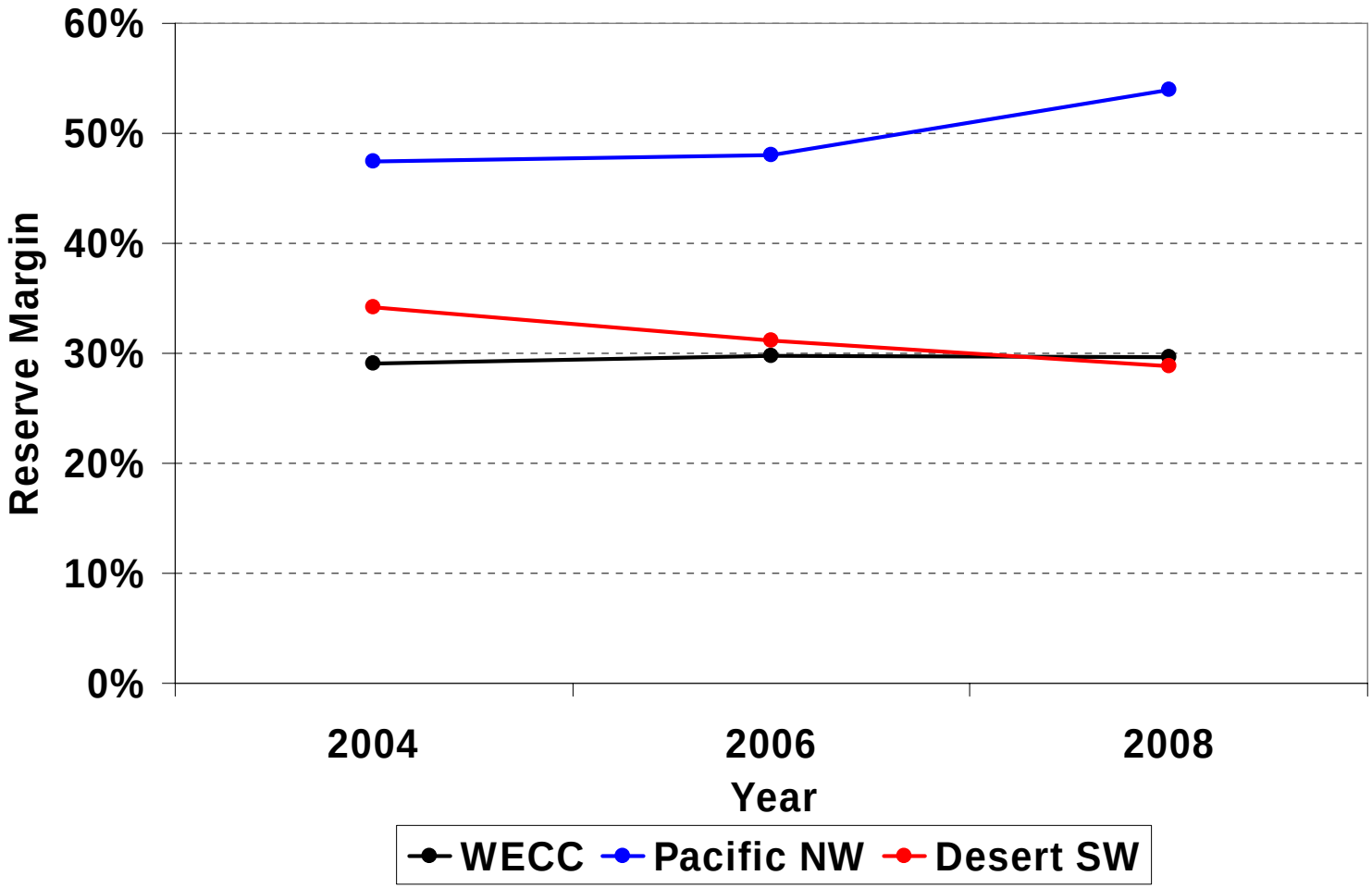
Southwest Capacity Additions by Fuel Type



Northwest Capacity Additions by Fuel Type

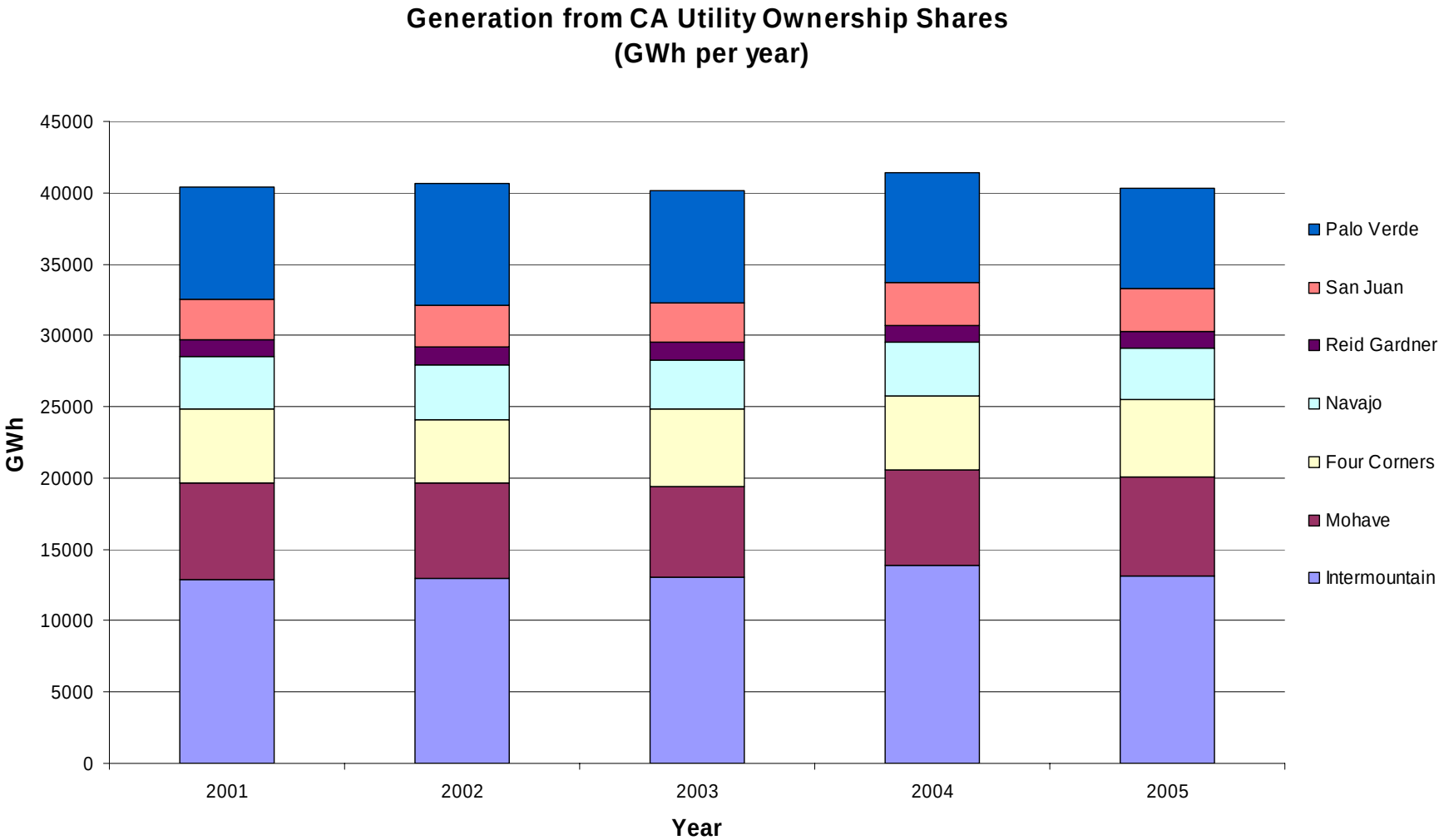


WECC Region & Intraregional Reserve Margins



Proposed Methodology to Estimate Imports Resource Mix

- First identify ownership generation
- Identify long-term power purchase contracts and entitlements (i.e. Hoover)
- Remaining balance are considered system imports
- Require a system analysis to estimate associated generation serving these imports

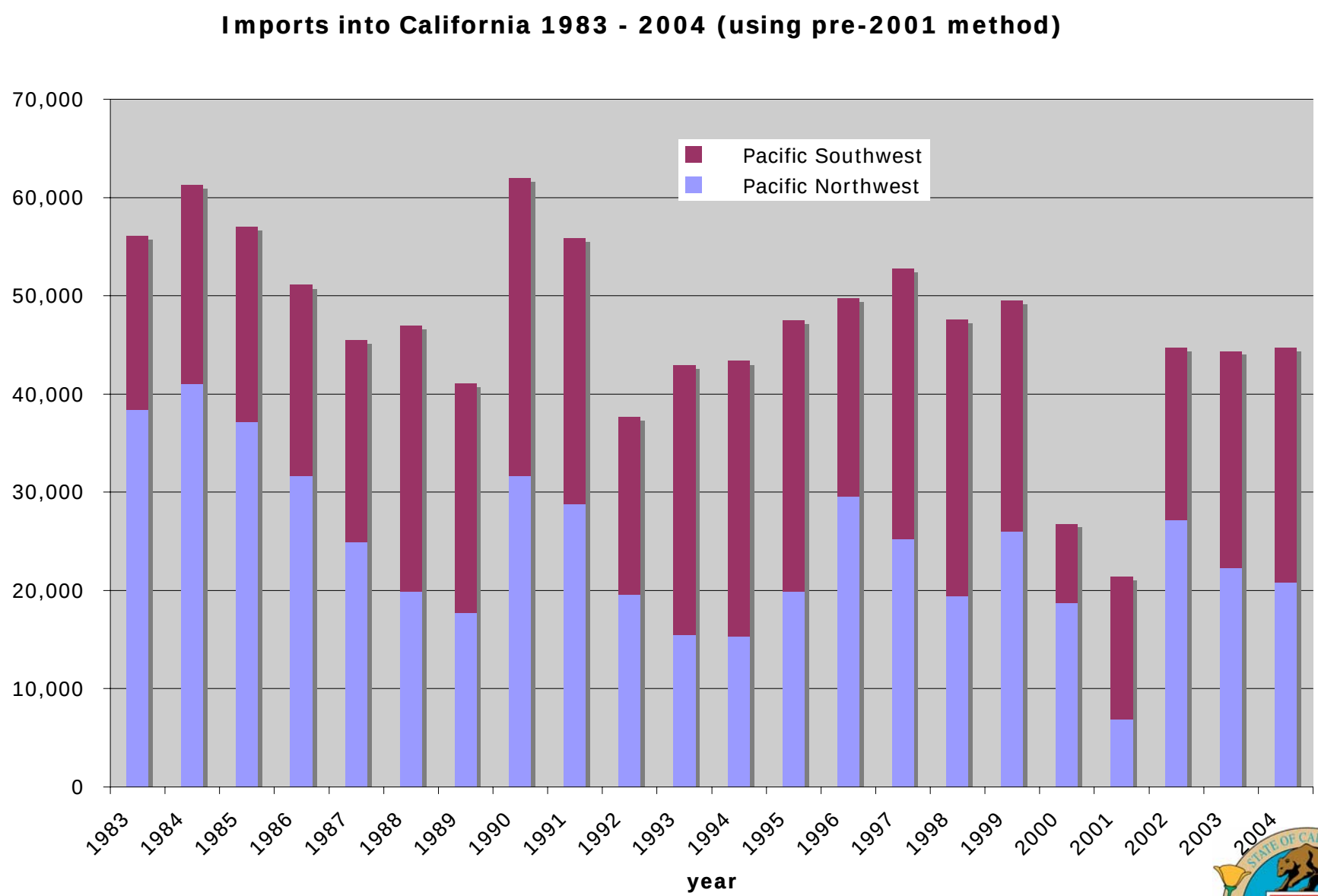

Generation from CA Utility Ownership Shares
(GWh per year)
GWh
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
2001
2002
2003
2004
2005
Year
Palo Verde
San Juan
Reid Gardner
Navajo
Four Corners
Mohave
Intermountain

2005 Firm and System Electricity Imports (GWh)

Imports Type	PNW	SW	Total
Total Imports	22,347	65,865	88,212
Firm Imports	1,123	44,159	45,282
System Imports	21,224	21,706	42,930

Resource Mix of System Imports

- Electricity is typically traded between many market participants
- The actual source is not tracked.
- System purchases are supplied by surplus electricity generation
- The surplus generation is estimated separately for the Pacific Northwest (PNW) and Desert Southwest (SW).


Imports into California 1983 - 2004 (using pre-2001 method)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Pacific Southwest
Pacific Northwest
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
year

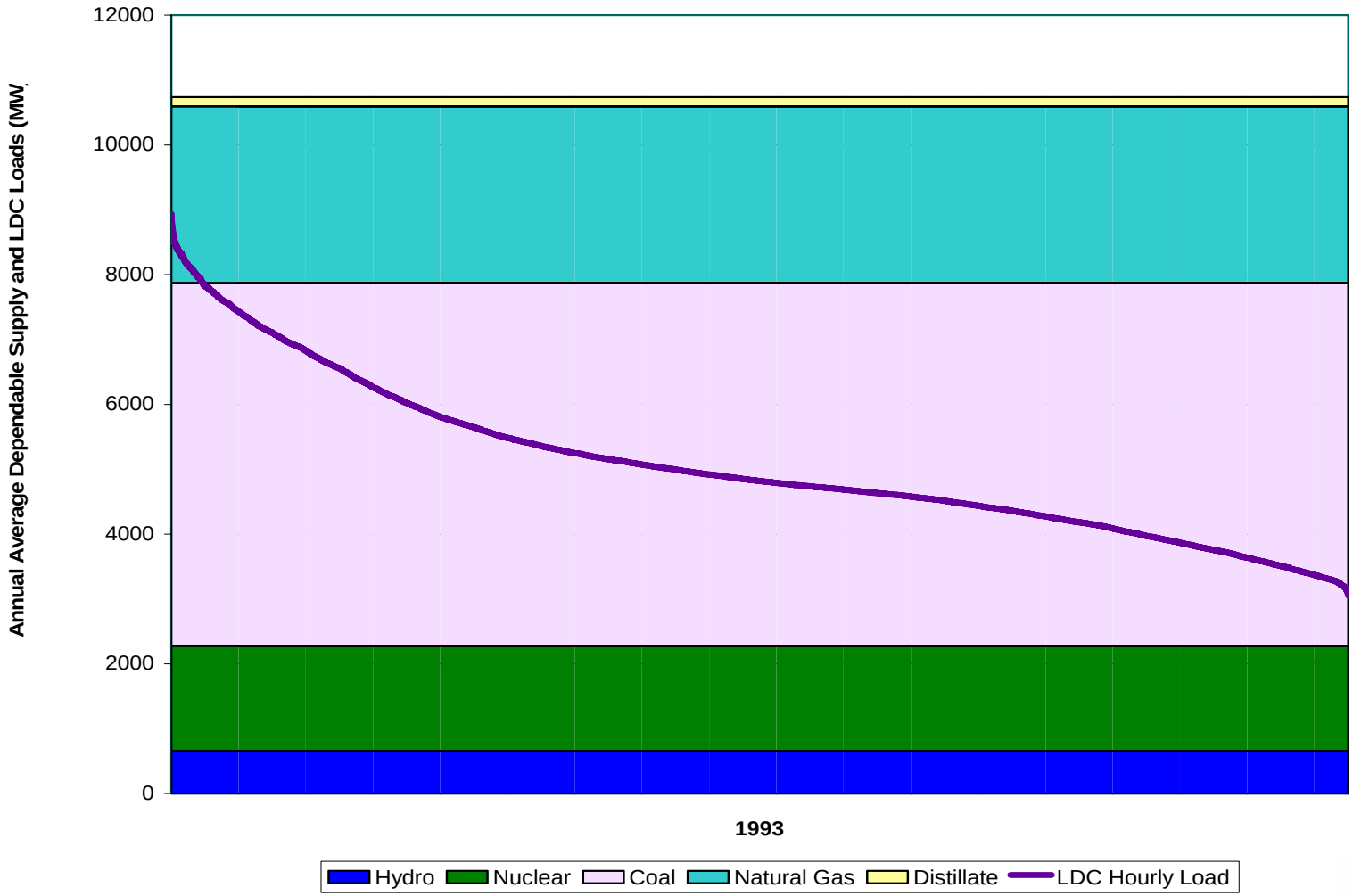
Marginal Generation Resources Used for Electricity System Imports

- Utilities and generators typically use their cheapest electricity supplies to meet customer obligations
- Baseload generation is usually the lower cost resource, mostly owned by utilities
- Remaining surplus are generally the marginal generation resources
- Electricity from marginal generation will be sold if there is a market

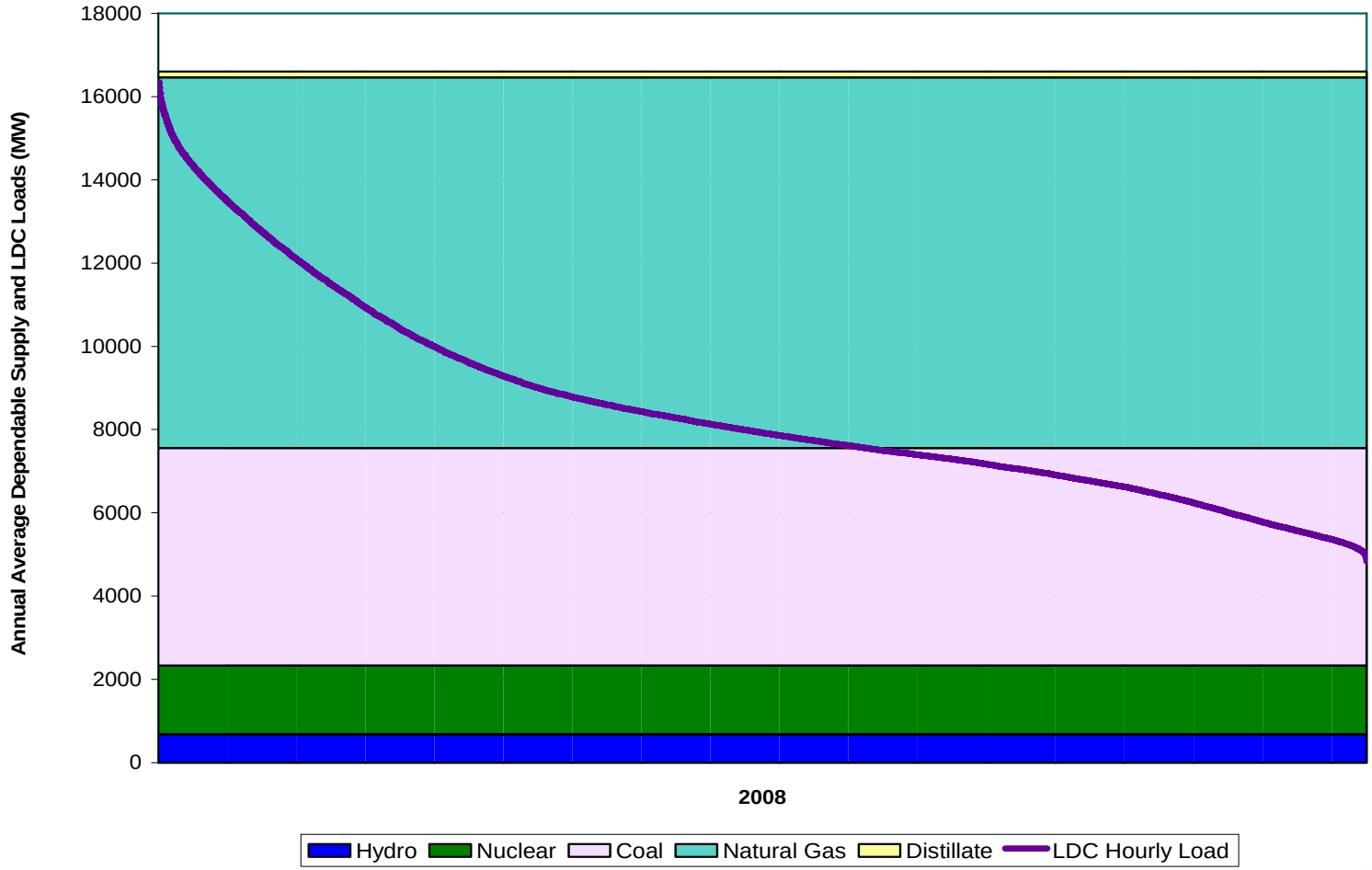
Marginal Generation Study

- System simulations to identify marginal resources
- Gas-fired generation on the margin 96% of the time
- Coal-fired generation on the margin 4% of the time
- Marginal Generation results applied to the resource mix of the electricity system imports from the SW region
- PNW imports require a different consideration

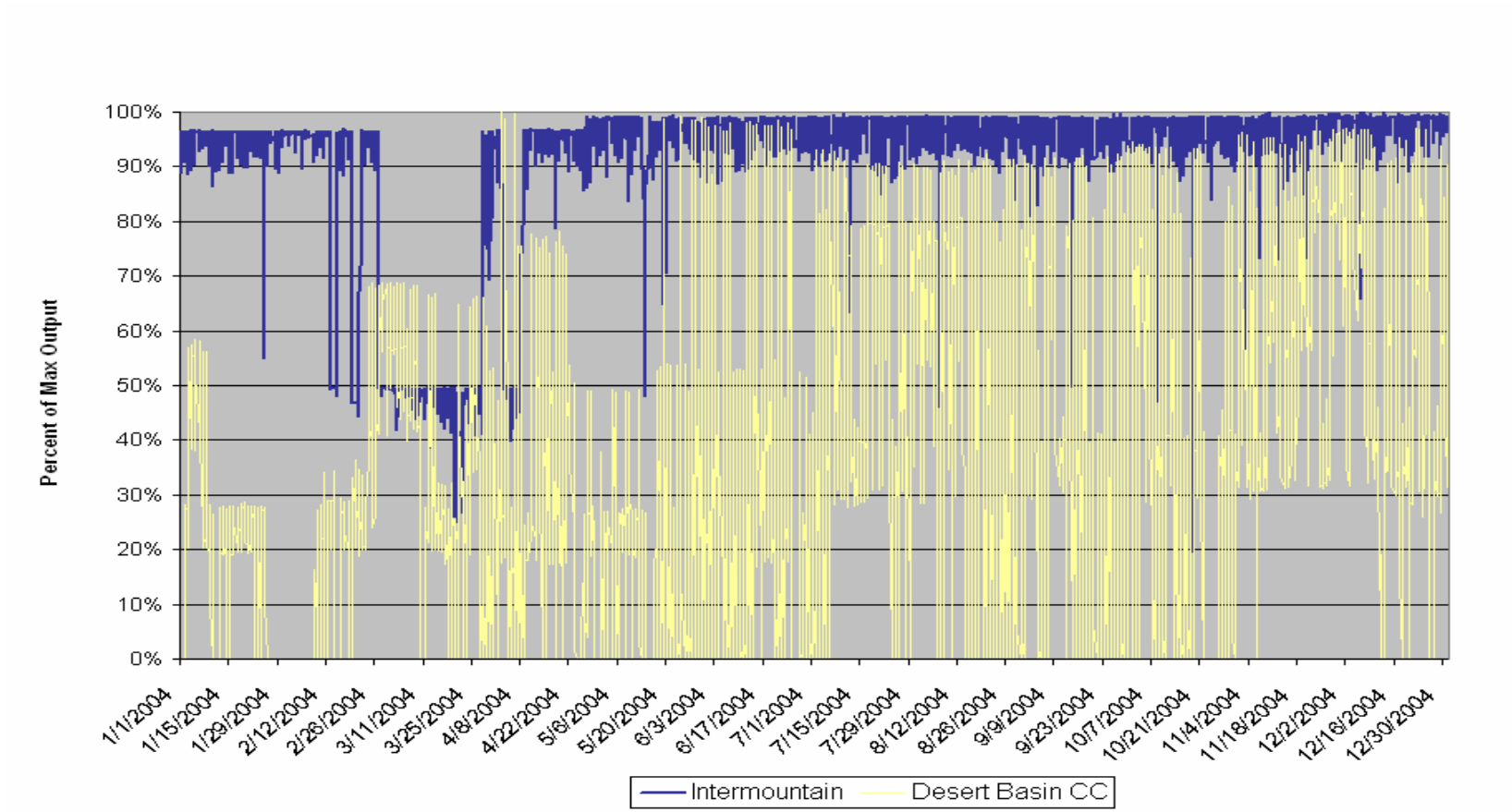
Arizona 1993 LDC Load and Supply



Arizona 2008 LDC Loads and Supply

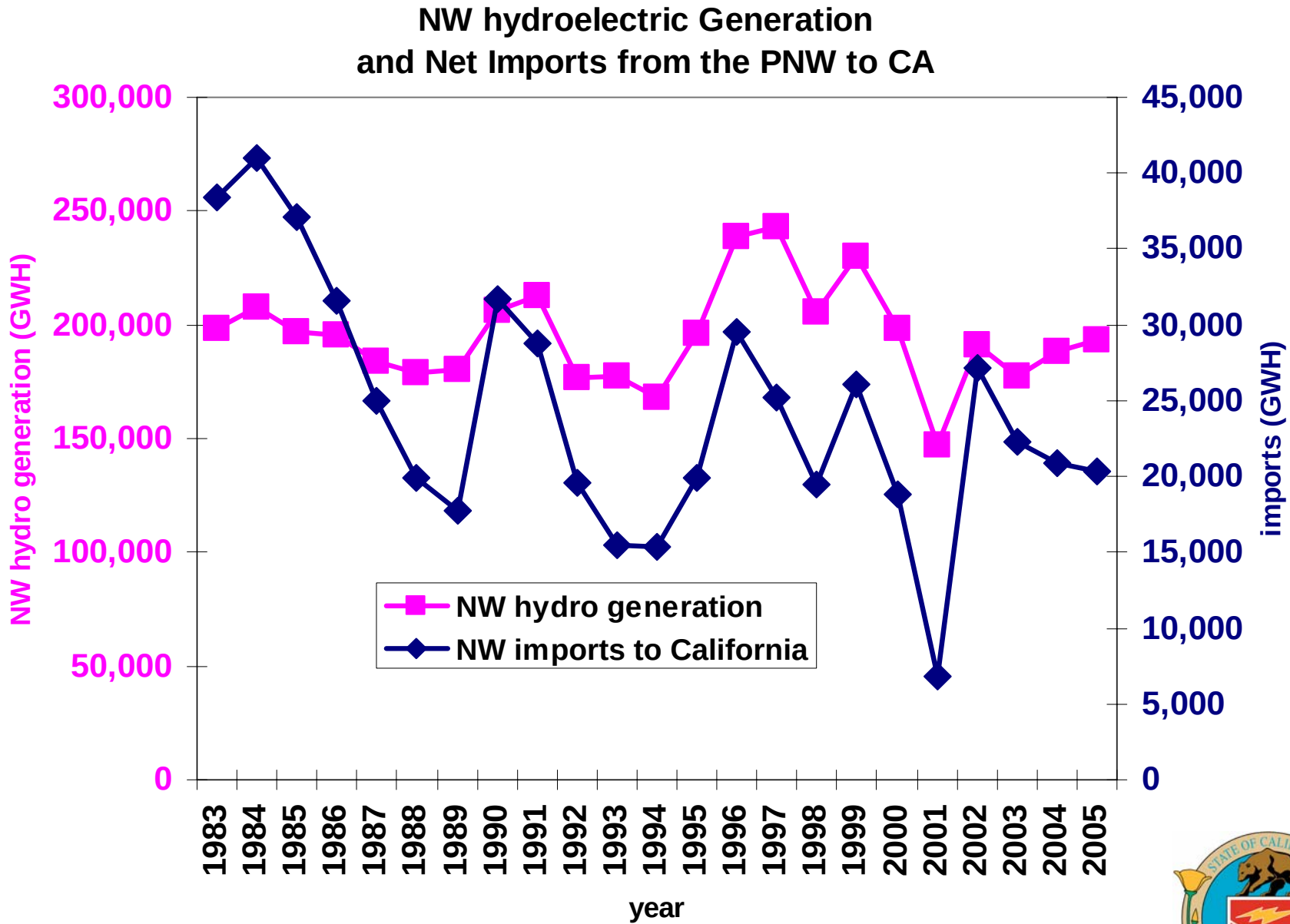


Comparison of the Operating Profiles of Coal and Gas Generation Facilities

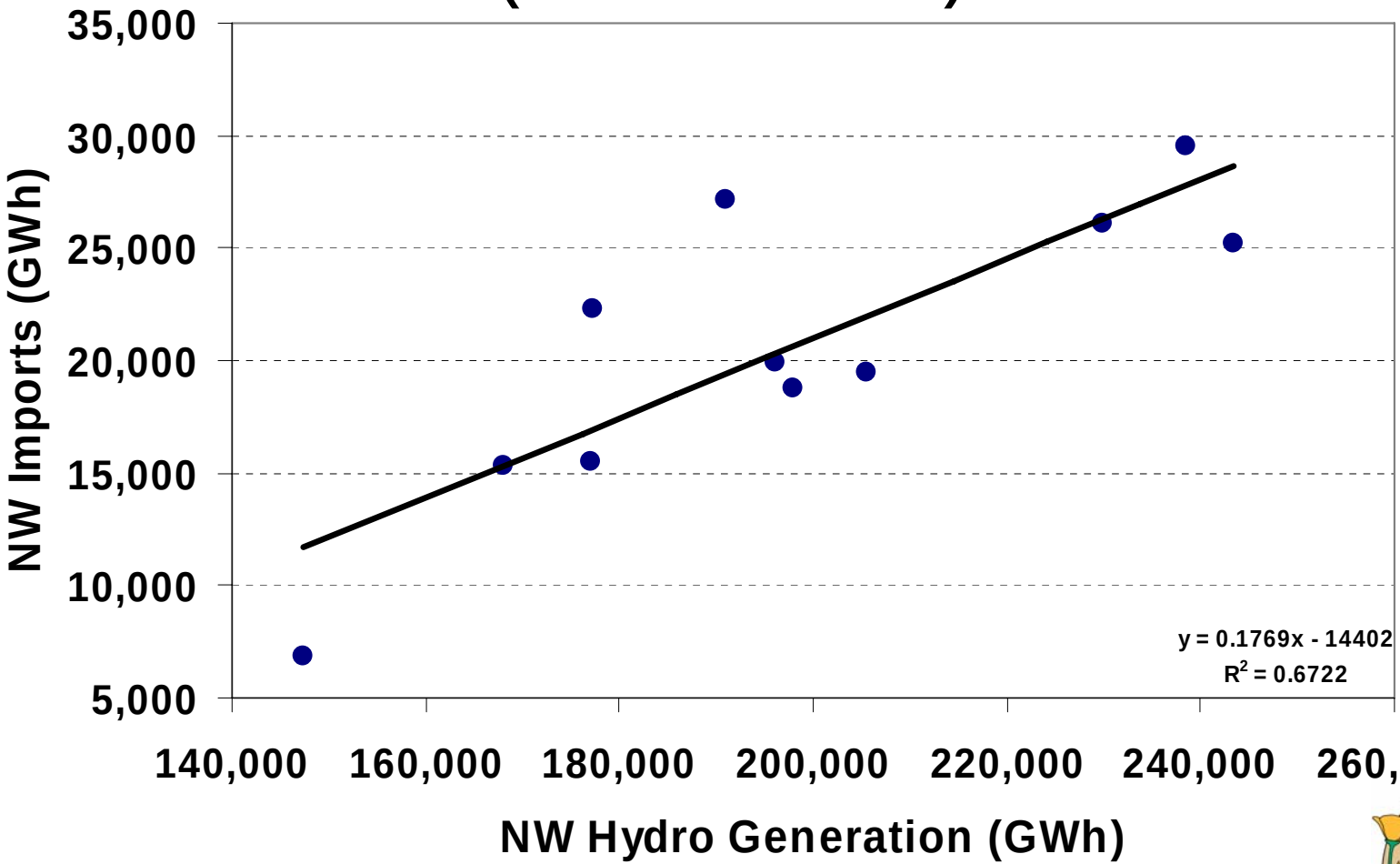


System Imports from Pacific Northwest

- PNW system operates differently than the SW system
- PNW predominately a hydroelectric system
- High correlation between PNW water conditions and system imports
- Assume that 50% of system imports are from hydroelectric generation
- 46% from natural gas-fired generation
- 4 % from coal-fired facilities


NW hydroelectric Generation
and Net Imports from the PNW to CA
NW hydro generation (GWH)
imports (GWH)
300,000
250,000
200,000
150,000
100,000
50,000
0
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
NW hydro generation
NW imports to California
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
year

PNW Hydro Generation and CA Imports (1993 to 2003)



Proposed Resource Mix Results for 2005

(GWH and Percent)

	PNW	Share	SW	Share	Total	Share
Total Imports	22,347		65,866		88,212	
Coal	1,758	7.9%	35,860	54.4%	37,617	42.6%
Hydro	10,723	48.0%	2,093	3.2%	12,816	14.5%
Natural Gas	9,866	44.1%	20,839	31.6%	30,705	34.8%
Nuclear	0	0.0%	7,074	10.7%	7,074	8.0%

Resource Mix for 2005
Using Net System Power Report Approach

(GWh and Percent)

	PNW	Share	SW	Share	Total	Share
Total Imports	22,347		65,866		88,212	
Coal	5,426	24.3%	47,028	71.4%	52,454	59.4%
Hydro	14,192	63.5%	1,844	2.8%	16,036	18.2%
Natural Gas	1,967	8.8%	11,724	17.8%	13,691	15.5%
Nuclear	761	3.4%	5,269	8.0%	6,030	6.8%

Comparison of 2005 Statewide Resource Mix

Proposed and Net System Power Report Methodologies

Resource Type	Proposed Methodology	Net System Power Methodology
Coal	14.3%	20.1%
Large Hydro	16.3%	17.0%
Natural Gas	43.8%	37.7%
Nuclear	14.9%	14.5%
Renewables	10.7%	10.7%
Total	**100.0%**	**100.0%**

Conclusion

- Staff believes that the proposed methodology is a more accurate approach
- If the proposed methodology is adopted by the Commission, staff will then apply the estimates to calculate the associated green-house gas emissions.